

CLAIMS

1. A magnetic memory comprising:
 - a substrate;
 - a lower portion structure provided on an upside of said substrate as a portion of a magnetic element;
 - an upper portion structure provided on an upside of said lower portion structure of said magnetic element; and
- 10 a sidewall insulating film provided to surround said upper portion structure of said magnetic element.
2. The magnetic memory according to claim 1,
 - 15 wherein said magnetic element has a size of an outer circumference of said sidewall insulating film.
3. The magnetic memory according to claim 1 or 2, wherein said lower portion structure of said magnetic element comprises:
 - 20 a conductive portion; and
 - a first magnetic film provided on an upside of said conductive portion, and
 - 25 said upper portion structure of said magnetic element comprises:
 - an insulating film;
 - a second magnetic film provided on an upside

of said insulating film.

4. The magnetic memory according to claim 1 or 2, wherein said lower portion structure of said 5 magnetic element comprises a conductive portion, and said upper portion structure of said magnetic element comprises:

 a first magnetic film;
 an insulating film formed on an upside of 10 said first magnetic film; and
 a second magnetic film provided on an upside of said insulating film.

5. The magnetic memory according to claim 3 or 15 4, wherein said upper portion structure of said magnetic element further comprise:

 a conductive film formed on an upside of said second magnetic film.

20 6. The magnetic memory according to any of claims 1 to 5, wherein a plane shape of said upper portion structure of said magnetic element is any one of an oval, a cycloid, a rectangle, a hexagon, and a corner quadrangle.

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7. The magnetic memory according to any of claims 1 to 6, wherein a distance d on a plane between

an outer circumference of an upper surface of said lower portion structure of said magnetic element and an outer circumference of an upper surface of said upper portion structure of said magnetic element has a
5 relation of $0.01 \text{ m} \leq d \leq 0.2 \text{ m}$.

8. The magnetic memory according to any of claims 1 to 7, further comprising:

an interlayer insulating film formed to cover
10 said lower portion structure of said magnetic element, said sidewall insulating film, and said upper portion structure of said magnetic element,

said interlayer insulating film has a via-hole on an upside of said upper portion structure of
15 said magnetic element, and

said sidewall insulating film is formed of a material which has an etching selection ratio smaller than said interlayer insulating film.

20 9. The magnetic memory according to any of claims 1 to 7, further comprising:

an interlayer insulating film formed to cover said lower portion structure of said magnetic element and said sidewall insulating film, and

25 said sidewall insulating film is formed of a material which has a selection ratio in a chemical mechanical polishing or an etching-back smaller than

said interlayer insulating film.

10. The magnetic memory according to any of claims 1 to 9, wherein said sidewall insulating film 5 is formed of at least one of metal nitride, metal oxide, and metal carbide.

11. The magnetic memory according to any of claims 1 to 10, wherein said sidewall insulating film 10 comprises at least one of silicon oxide, silicon nitride, aluminum oxide, and aluminum nitride.

12. A method of manufacturing a magnetic memory comprising:

15 forming a multi-layer film included in a magnetic element on an upside of a substrate; etching said multi-layer film into a predetermined pattern up to a predetermined depth, to form an upper portion structure of said magnetic 20 element;

forming a sidewall insulating film to surround said upper portion structure of said magnetic element;

25 etching said multi-layer film by using said sidewall insulating film and said upper portion structure of said magnetic element as a mask to form a lower portion structure of said magnetic element as a

remaining portion of said magnetic element.

13. The method according to claim 12, wherein
said lower portion structure of said magnetic element
5 includes a conductive portion and a first magnetic
layer formed on an upside of said conductive portion,
and

10 said upper portion structure of said magnetic
element comprises an insulting layer and a second
magnetic layer formed on an upside of said insulating
layer.

14. The method according to claim 12 or 13,
wherein said etching said multi-layer film into a
15 predetermined pattern, comprises:

etching said multi-layer film into said
predetermined pattern by using a physical etching.

15. The method according to claim 14, wherein
20 said physical etching is ion milling.

16. The method according to any of claims 12 to
15, wherein said lower portion structure of said
magnetic element comprises a conductive portion, and
25 said upper portion structure of said magnetic
element comprises:

a first magnetic layer;

an insulating layer formed on an upside of
said first magnetic layer; and

a second magnetic layer formed on an upside
of said insulating layer.

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17. The method according to claim 16, wherein
said etching said multi-layer film is carried out by
using a physical and chemical etching.

10 18. The method according to claim 16, wherein
said physical and chemical etching is a reactive ion
etching.

19. The method according to any of claims 12 to
15 18, further comprising:

forming an interlayer insulating film to
cover said lower portion structure of said magnetic
element, said sidewall insulating film, and said upper
portion structure of said magnetic element; and

20 forming a via-hole in said interlayer
insulating film on an upside of said upper portion
structure of said magnetic element by an etching
method,

25 said sidewall insulating film is formed of a
material which has an etching selection ratio smaller
than said interlayer insulating film.

20. The method according to any of claims 12 to 19, further comprising:

forming an interlayer insulating film to cover said lower portion structure of said magnetic element, said sidewall insulating film, and said upper portion structure of said magnetic element; and

flattening said interlayer insulating film on an upside of said upper portion structure of said magnetic element by a chemical mechanical polishing 10 method or an etching-back method,

said sidewall insulating film is formed of a material which has a selection ratio in the chemical mechanical polishing method or the etching-back method smaller than said interlayer insulating film.